

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

41616/VGG/B694

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

Not Yet Assigned

09/744515

INTERNATIONAL APPLICATION NO.  
PCT/NZ99/00114INTERNATIONAL FILING DATE  
July 26, 1999PRIORITY DATE CLAIMED  
July 28, 1998

TITLE OF INVENTION

'GEARBOX ADAPTER'

ORIGINAL

APPLICANT(S) FOR DO/EO/US

Ernest Paul Goatley

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

## Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

- a. Notification of Receipt of Demand dated: 2 December 1999
- b. Publication of PCT Application No. WO 00/06927
- c. Declaration and Power of Attorney by Ernest Paul Goatley
- d. Verified Statement Claiming Small Entity Status
- e. Notice Informing Applicant of Communication Concerning Elected Offices
- f. Notice Informing Applicant of Communication to Designated Offices

U.S. APPLICATION NO. (IF KNOWN) **09/704515** INTERNATIONAL APPLICATION NO. **PCT/NZ99/00114** ATTORNEY'S DOCKET NUMBER **41616/VGG/B694**  
**Not Yet Assigned**

21. The following fees are submitted:

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :**

- ☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... **\$970.00**
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... **\$840.00**
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... **\$690.00**
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... **\$670.00**
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... **\$96.00**

**ENTER APPROPRIATE BASIC FEE AMOUNT =**

**CALCULATIONS PTO USE ONLY**

**\$970.00**

Surcharge of **\$130.00** for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

**\$130.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	14 - 20 =	0	x \$18.00
Independent claims	1 - 3 =	0	x \$78.00

**\$0.00**

Multiple Dependent Claims (check if applicable) ☒

**\$260.00**

**TOTAL OF ABOVE CALCULATIONS =**

**\$1,360.00**

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable) ☒

**\$680.00**

**SUBTOTAL =**

**\$680.00**

Processing fee of **\$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

**\$0.00**

**TOTAL NATIONAL FEE =**

**\$680.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable) ☐

**\$0.00**

**TOTAL FEES ENCLOSED =**

**\$680.00**

Amount to be:	\$
refunded	
charged	\$

☒ A check in the amount of **\$680.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \_\_\_\_\_ to cover the above fees.  
 A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **03-1728** A duplicate copy of this sheet is enclosed.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

Vincent G. Gioia  
 CHRISTIE, PARKER & HALE, LLP  
 350 West Colorado Boulevard, Suite 500  
 Post Office Box 7068  
 Pasadena, California 91150

  
 SIGNATURE

Vincent G. Gioia

NAME

19,959

REGISTRATION NUMBER

January 23, 2001

DATE

Docket No. : \_\_\_\_\_  
Applicant or Patentee : \_\_\_\_\_  
Serial or Patent No. : \_\_\_\_\_  
Filed or Issued : \_\_\_\_\_  
Entitled : \_\_\_\_\_

CHRISTIE, PARKER & HALE, LLP  
Post Office Box 7068  
Pasadena, CA 91109-7068  
(626) 795-9900

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS  
(37 CFR § 1.9(f) and § 1.27(b))  
INDEPENDENT INVENTOR

As a below-named inventor, I declare that I qualify as an independent inventor as defined in 37 CFR § 1.9(c) for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled

Gearbox Adaptor

described in

☒ the specification filed herewith  
\_\_\_\_\_ application Serial No. \_\_\_\_\_, filed \_\_\_\_\_  
\_\_\_\_\_ Patent No. \_\_\_\_\_, issued \_\_\_\_\_

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR § 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR § 1.9(d) or a nonprofit organization under 37 CFR § 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed, or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below.

☒ No such person, concern or organization.  
\_\_\_\_\_  
Persons, concerns or organizations listed below. (NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. 37 CFR § 1.27)

Full name \_\_\_\_\_

Address \_\_\_\_\_  
\_\_\_\_\_ INDIVIDUAL \_\_\_\_\_ SMALL BUSINESS CONCERN \_\_\_\_\_ NONPROFIT ORGANIZATION

Full name \_\_\_\_\_

Address \_\_\_\_\_  
\_\_\_\_\_ INDIVIDUAL \_\_\_\_\_ SMALL BUSINESS CONCERN \_\_\_\_\_ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR § 1.28(b))

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified

2/PMB  
Title:     **GEARBOX ADAPTOR**

Technical Field

The present invention relates to a gearbox adaptor for insertion into a standard gearbox to convert a standard gearbox to a sequential gearbox. As used herein, the  
5 term 'standard gearbox' means a gearbox in which, to change from one gear to another, the gear-lever must be moved in a direction which depends upon which gear is being moved out of and which gear is being moved into. The term 'sequential gearbox' means a gearbox in which to change up a gear, the gear-lever always is moved in one direction, and to change down a gear, the gear-lever always is moved  
10 in the opposite direction.

Sequential gearboxes are especially useful in racing and rally cars, where rapid gear changes without looking at the gear-lever are essential.

Background Art

Purpose-built sequential gear boxes are known, but are much more expensive than  
15 standard gearboxes. Further, known sequential gearboxes provide a comparatively slow gear-change:- the engine must be unloaded to change gear, and the car therefore decelerates for the period of the gear change, (typically about 0.1 sec.), resulting in a loss of speed of the order of 3.5 kph.

It is therefore an object of the present invention to provide a gearbox adaptor which is  
20 capable of insertion into a standard gearbox to convert it to a sequential gearbox, the combination of providing a sequential gearbox in which gear changes can be made rapidly (typically 0.02 sec.) and at full throttle, so that the car does not lose speed during a gear change.

Disclosure of Invention

25 The present invention provides a gearbox adaptor including: a hub adapted to be engageable with a gear shaft for rotation therewith; at least one piston mounted within said hub; means for supplying fluid from the exterior of the hub to a first face of the or each said piston, so as to move said piston in a first direction; at least one clutch means adjacent the or each said piston, part of the or each said clutch means  
30 being engaged with said hub and a different part of the or each said clutch means being engageable with a gear locatable on said gear shaft adjacent said hub; the or

each said clutch means being located and arranged such that movement of said piston in said first direction inter-engages said parts of said clutch to drivingly engage said gear and said gear shaft.

5 Preferably, the piston and clutch means both are annular and are concentric with each other and with the hub. Preferably, the hub is concentrically engageable with the gear shaft.

10 Preferably the adaptor further comprises a casing surrounding at least part of the exterior of said hub, said casing being mounted upon said hub but not rotatable therewith; at least one first fluid passage being formed between the interior of the casing and the exterior of the hub, the or each said first fluid passage being in communication with said means for supplying fluid to a first face of the or each said piston, which comprises at least one second fluid passage formed through said hub.

15 It is known to provide a hydraulically operated piston, clutch, and hub system for a gearbox, but known systems supply hydraulic fluid through the gear shaft. This arrangement cannot be used to adapt existing gearboxes, since in existing standard gearboxes, the shafts are not provided with hydraulic passages.

20 The present invention further provides a sequential gearbox as defined above which includes a standard gearbox from which the synchro-hubs and cones have been removed and a gearbox adaptor in accordance with the present invention has been fitted to each gear. It is possible to use an adaptor of the present invention to adapt each gear individually, but preferably the double adaptor of the present invention is used, with each double adaptor being fitted between each pair of adjacent gears in the standard gearbox.

25 Preferably, all of the gears of a standard gearbox are adapted to the present system, but it is also possible to adapt only some of the gears of a standard gearbox, and leave the remaining gear or gears to be operated in known manner.

30 The sequential gearbox described above preferably includes electronic control means which comprises two micro switches which are connected via a sequencing arrangement to a set of solenoid valves, one solenoid valve being connected to the means for supplying fluid to each piston such that fluid is supplied to said piston when said solenoid valve is open and fluid is withdrawn from said piston when said solenoid valve is closed; the control means being such that each time the first micro switch is closed, the sequencing arrangement closes any solenoid valve which is

open and opens the next solenoid valve in a predetermined first sequence, and each time the second micro switch is closed, the sequencing arrangement closes any solenoid valve which is open and opens the next solenoid valve in a predetermined second sequence.

- 5 Preferably, the or each clutch means comprises a clutch pack which consists of a first series of spaced plates each of which is engageable with the hub for rotation therewith but which is reciprocable parallel to the longitudinal axis of said hub; and a second series of spaced plates each of which is engageable with a gear mounted upon said gear shaft but which is reciprocable parallel to the longitudinal axis of said  
10 hub; said second series of plates being interleaved with the plates of said first series.

#### Brief Description of Drawings

By way of example only, a preferred embodiment of the present invention is described in detail, with reference to the accompanying drawings, in which:-

- Fig. 1 is a schematic sectional view through part of a gearbox adaptor in accordance  
15 with the present invention, the adaptor being for a pair of gears;

Fig. 2a and 2b are plan views of two clutch components; and

Fig. 3 is a block diagram showing the electronic controls.

#### Best Mode of Carrying Out the Invention

- Referring to Figs. 1 and 2 of the drawings, a gearbox adaptor 2 comprises a central  
20 splined shaft 3 upon which are mounted a hub 4, a first gear 5, a second gear 6, two pistons 7, 8 and two clutch packs 9, 10.

The shaft 3 is the main shaft of a standard gearbox and is externally splined, and driven in known manner. The hub 4 is internally splined and the hub splines engage the splines of the shaft 3 so that the hub 4 rotates with the shaft 3.

- 25 The first and second gears 5, 6 are gears of known type, forming part of a standard gearbox and are freely rotatable relative to the shaft 3, but are fixed in position relative to the length of the shaft 3.

- The hub 4 has a central portion 4a concentric with the shaft 3, with a rim 11 around the periphery of said central portion. The rim 11 is of greater width than the central  
30 portion 4a.

The extension of the rim beyond the central portion of the hub provides two annular recesses in which the pistons 7, 8 and the clutch packs 9, 10 are mounted, concentric with the shaft 3.

Each piston 7, 8, is annular and is mounted adjacent one side of the central portion 5 4a of the hub, spaced from the hub by a passage 13, 14 respectively. The passages 13, 14 are connected to corresponding passages 15, 16 in the hub 4, through which hydraulic fluid can be supplied to the passages 13, 14, as hereinafter described.

Pairs of annular seals 17, 18, 19, 20 respectively, seal the gaps between the edges of the pistons 7, 8 and the adjacent walls of the gears and the hub respectively.

10 A further annular seal 21 (e.g. a cast-iron seal ring) extends around the outer wall of the rim between the passages 15 and 16. The seal 21 extends between the outer wall of the rim and a casing 22 which surrounds the hub 4 and is located on the hub by circlips 23. Bushes 24 may be located between the opposed faces of the hub 4 and casing 22, to permit the casing 22 to remain stationary while the hub 4 rotates.  
15 Alternatively, the bushes 24 may be omitted since the combination of the seal 21 and the layer of hydraulic fluid in the passages 15b, 16b between the outer wall of the rim and the inner wall of the casing 22 effectively acts as a bearing in practice.

Fluid passages 15a, 16a, corresponding to passages 15 and 16 are formed in the casing 22, for supply of hydraulic fluid.

20 Each clutch pack 9, 10 comprises a series of annular steel plates 25 interleaved alternately with a series of annular bronze plates 26. Each steel plate 25 is formed with four equidistantly-spaced dogs 27 (Fig. 2a only) which are dimensioned and arranged to engage corresponding grooves (not shown) in the adjacent face of the rim 11, so that the steel plates rotate with the hub but can move relative to the hub in  
25 the directions indicated by arrows A and B.

Alternatively, the steel plates 25 may be formed with external splines instead of the dogs 27, said splines engaging corresponding splines formed in the rim 11.

Each bronze plate 26 is formed with splines 28 around its inner periphery. The splines 28 are received in corresponding grooves (not shown) on the adjacent  
30 portions 30 of the gears 5, 6, so that the bronze plates 26 rotate with the gears 5, 6, but can move relative to the gears in the directions of arrows A and B.

It will be appreciated that the bronze plates 26 could be formed with dogs rather than splines. Further, the materials of which the clutch pack plates are made can be varied:- any suitable materials having acceptable wear characteristics and providing a good frictional grip, may be used (e.g. carbon fibre, sintered bronze).

- 5 To convert the whole of a standard gearbox using the present invention, all of the synchro-hubs and cones are removed from the standard box, and a gearbox adaptor as described above is fitted between each pair of gears: first/second and third/fourth. For reverse gear, the standard clutch system may be retained, or a single gear adaptor as hereinafter described, can be used. If the standard gearbox has an odd  
10 number of forward gears, then either the standard clutch system is used for the 'odd' gear or a single gear adaptor can be used.

To modify the above-described adaptor for a single gear, the hub shown in Fig. 1 is effectively split in two, by terminating the hub on a line X-X in Fig. 1, with a blank wall. This gives a single gear adaptor. It is possible to use a single-gear adaptor for  
15 each gear in a multi-gear box, but it is preferred to use two-gear adaptors as shown in Fig. 1, since this gives a more compact construction.

It also is possible to construct an adaptor as a single unit for three or more gears, by extending the design of Fig. 1. Further, although the invention is described as an adaptor for an existing gearbox, it will be appreciated that it is possible to build a  
20 gearbox 'from scratch' incorporating the adaptor of the present invention.

The above-described system can be controlled by any suitable control, but preferably is controlled by an electronic/hydraulic system as shown in Fig. 3.

The control system includes an electronic joystick (not shown) which is connected to a first and a second micro-switch 32, 33 such that when the joystick is moved in one  
25 direction, the first micro-switch 32 is closed, and when the joystick is moved in the opposite direction, the second micro-switch 33 is closed. The micro-switches 32, 33 are connected to a series of solenoid valves 50,60,70,80, each controlling the flow of hydraulic fluid to one section of one of the hubs 4, via a series of relays 51,61,71,81 and a sequencing arrangement (e.g. a control integrated circuit) which provide that  
30 each time the first micro-switch 32 is closed, the next solenoid in the sequence 50,60,70,80 is opened and each time the second micro-switch 33 is closed, the next solenoid in the sequence 80,70,60,50 is opened.



When the first solenoid valve is opened, hydraulic fluid is supplied through that valve to one of the passages 16a and hence to the associated passages 16 and 14, to push the piston 8 in the direction of arrow B. The piston 8 contacts the plates of the clutch pack 10 and pushes them in the same direction, urging the plates of the clutch pack into contact with each other and with the face 31 of the first gear. Since the plates 25 of the clutch pack are splined to the hub 4 and the plates 26 to the gear 5, and the hub 4 is splined to the shaft 3, pushing the plates 25, 26 together into driving contact with each other brings the first gear 5 into driving engagement with the shaft 3, and the gear rotates with the shaft, so that the vehicle drives in first gear. When the second solenoid valve is opened, the electronic control circuit closes the first solenoid. When the first solenoid valve is closed, the rotation of the gearbox tends to fling fluid out of the passages 14/16/16a, drawing the piston 8 back to the position of Fig. 1 and disengaging first gear.

When the second solenoid valve is opened, fluid is supplied to passages 15a/15 and 13 and the second gear is engaged in the same manner as the first.

Thus, every time the joystick is moved in said one direction, the solenoid valve (if any) which is open, is closed, and the next solenoid valve in the sequence 50,60,70,80 is opened, to engage the next higher gear. Every time the joystick is moved in the opposite direction, the solenoid valve which was open is closed, and next solenoid valve in the sequence 80,70,60,50 is opened to engage the next lower gear.

It is envisaged that the solenoid valves could be controlled automatically by a rev-counter, so that the gears are changed up or down automatically, depending upon the engine revs.

Claims

1. A gear box adaptor including: a hub adapted to be engageable with a gear shaft for rotation therewith; at least one piston mounted within said hub; means for supplying fluid from the exterior of the hub to a first face of the or each said piston, so as to move said piston in a first direction; at least one clutch means adjacent the or each said piston, part of the or each said clutch means being engaged with said hub and a different part of the or each said clutch means being engageable with a gear locatable on said gear shaft adjacent said hub; the or each said clutch means being located and arranged such that movement of said piston in said first direction inter-engages said parts of said clutch to drivingly engage said gear and said gear shaft.
2. The adaptor as claimed in claim 1 wherein said hub, the or each said piston and the or each said clutch means all are concentric and said hub is adapted to be concentrically engageable with said gear shaft.
3. The adaptor as claimed in claim 2 wherein the or each said piston and the or each said clutch means both are annular.
4. The adaptor as claimed in claim 2 or claim 3 wherein the or each said clutch means comprises a clutch pack which consists of a first series of spaced plates each of which is engaged with the hub for rotation therewith but which is reciprocable parallel to the longitudinal axis of said hub; and a second series of spaced plates each of which is engageable with a gear mounted upon said gear shaft but which is reciprocable parallel to the longitudinal axis of said hub; said second series of plates being interleaved with the plates of said first series.
5. The adaptor as claimed in any one claims 2-4 wherein the or each said clutch means and the or each said piston are mounted in a recess in said hub.
6. The adaptor as claimed in claim 5 further comprising a casing surrounding at least part of the exterior of said hub, said casing being mounted upon said hub but not rotatable therewith; at least one first fluid passage being formed between the interior of the casing and the exterior of the hub, the or each said first fluid passage being in communication with said means for supplying fluid to a first face of the or each said piston, which comprises at least one second fluid passage formed through said hub.

7. The adaptor as claimed in any one of claims 1-4 incorporating two said pistons and two said clutch means, the first piston and the corresponding first clutch means being mounted in a first recess formed in one end of the hub, and the second piston and the corresponding second clutch means being mounted in a second recess formed in the other end of the hub; wherein part of the first clutch means is engageable with a first gear and part of the second clutch means is engageable with a second gear.
8. The adaptor as claimed in claim 7 further comprising a casing surrounding at least part of the exterior of said hub, said casing being mounted upon said hub but not rotatable therewith; two separate first fluid passages being formed between the interior of the casing and the exterior of the hub, each said first fluid passage being in communication with the corresponding said means for supplying fluid to a first face of said corresponding piston, which comprises a second fluid passage formed through said hub.
9. The adaptor as claimed in any one of the preceding claims wherein said fluid is hydraulic fluid.
10. The adaptor as claimed in any one of the preceding claims where said fluid is pneumatic fluid.
11. A sequential gearbox as hereinbefore defined, including a standard gearbox from which the synchro-hubs and cones have been removed and a gearbox adaptor as claimed in any one of claims 1-6 has been fitted to each gear, with part of each hub mounted on the gear shaft and each clutch means engaged with the corresponding gear.
12. A sequential gearbox as hereinbefore defined, including a standard gearbox from which the synchro-hubs and cones have been removed and a gearbox adaptor as claimed in claim 7 or claim 8 has been fitted between each pair of adjacent gears, with each hub mounted on the gear shaft between said two adjacent gears and part of one clutch means engaged with one of said gears and part of the other clutch means engaged with the other of said gears.
13. A sequential gearbox as claimed in claim 11 or claim 12, further including electronic control means which comprises two micro-switches which are connected via a sequencing arrangement to a set of solenoid valves, one solenoid valve being connected to the means for supplying fluid to each piston

such that fluid is supplied to said piston when said solenoid valve is open and fluid is withdrawn from said piston when said solenoid valve is closed; the control means being such that each time the first micro-switch is closed, the sequencing arrangement closes any solenoid valve which is open and opens the next solenoid valve in a predetermined first sequence; and each time the second micro-switch is closed, the sequencing arrangement closes any solenoid valve which is open and opens the next solenoid valve in a predetermined second sequence.

14. The sequential gearbox as claimed in claim 13, wherein said predetermined second sequence is the reverse of said predetermined first sequence.

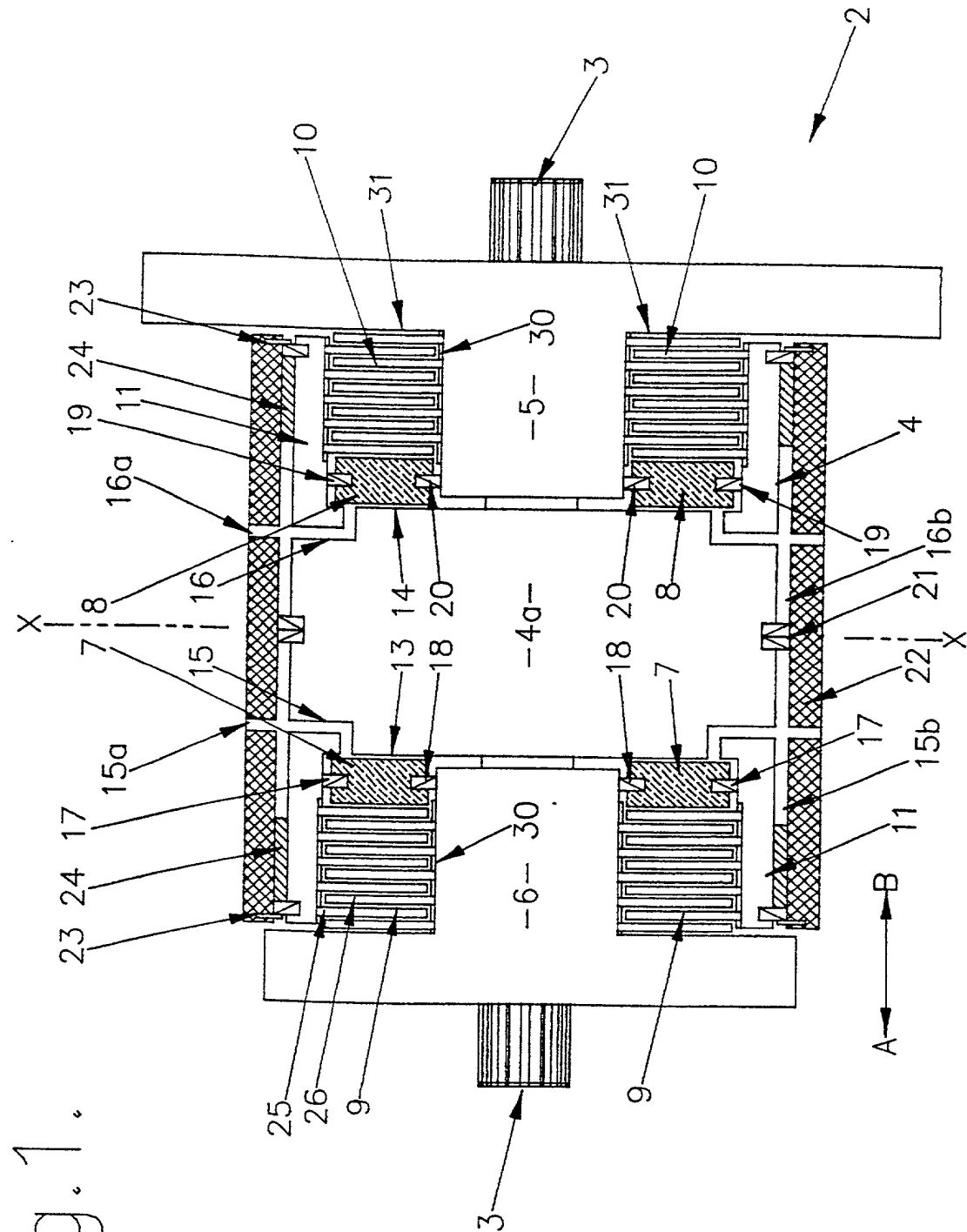
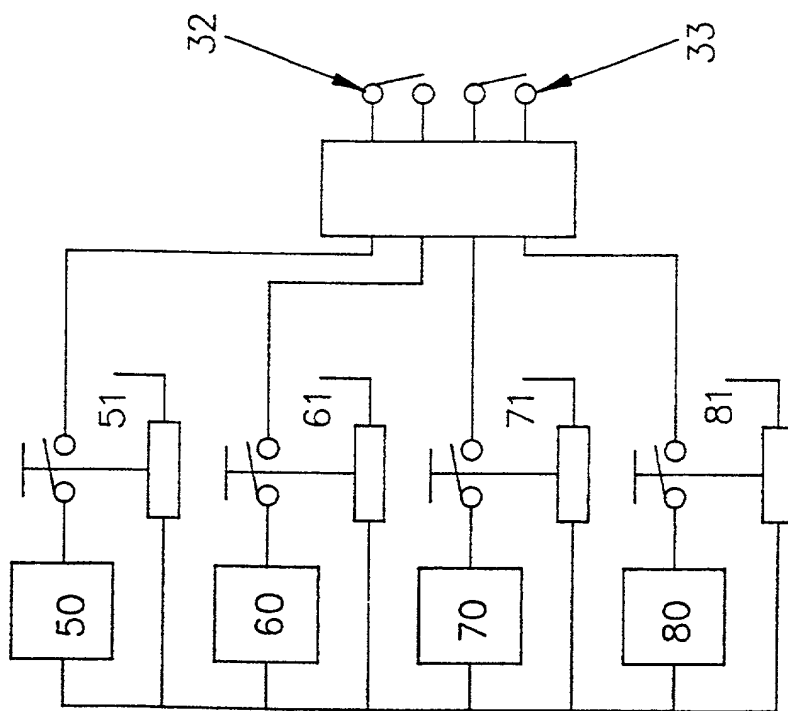
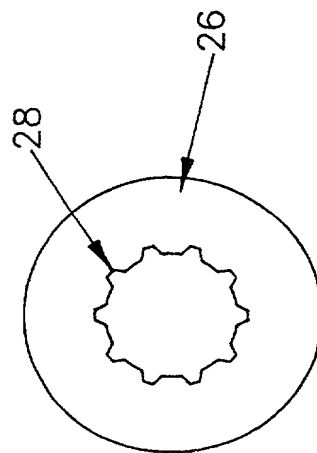
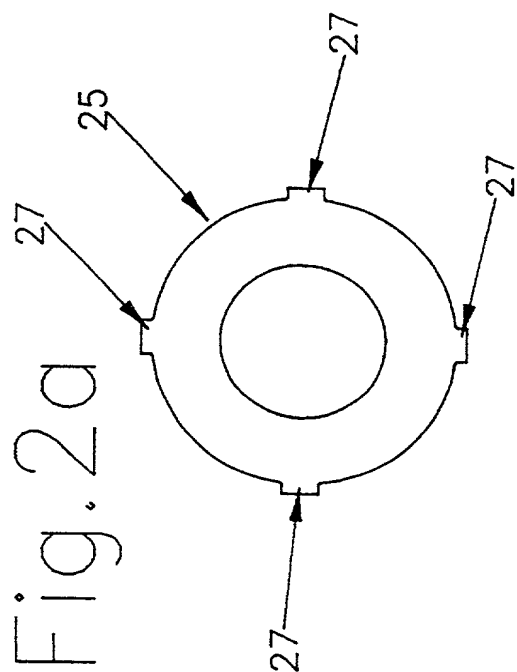


Fig. 1.

2/2



DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATIONS

PATENT

Docket No. :

As an inventor, I declare:

My residence address and citizenship are as stated next to my name. I believe I am the original, first and sole inventor (if only one name is listed below), or a joint inventor (if plural names are listed below) of the invention claimed in the patent application entitled:

(1) Gearbox Adaptor

the specification of which

(2) ☒ is attached.(3) ☐ was filed on \_\_\_\_\_ as Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I have reviewed and understand the contents of the specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with 37 CFR § 1.56.

(4) ☐ I hereby claim the benefit under Title 35, U.S.C. § 119(e) of any United States provisional application(s) listed below.

Application Serial Number

Filing Date

Application Serial Number

Filing Date

(5) ☒ I claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) of the foreign application(s) for patent or inventor's certificate listed below, and I have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Claimed

Application Serial Number	Filing Date	Application Serial Number	Filing Date	Priority Claimed
331192	New Zealand	28 July 1998		<input checked="" type="checkbox"/>
PCT/NZ99/00114	PCT	26 July 1999		<input checked="" type="checkbox"/>

(6) I claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below, and, insofar as this application discloses and claims subject matter not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose material information as defined in 37 CFR § 1.56 which occurred between the filing date of the prior application and the national or Patent Cooperation Treaty International filing date of this application:

Application Serial Number

Filing Date

Patented/Pending/Abandoned

Application Serial Number

Filing Date

Patented/Pending/Abandoned

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

(7) **POWER OF ATTORNEY:** I appoint the following attorneys and agents of the law firm CHRISTIE, PARKER & HALE, LLP to prosecute this application and any international application under the Patent Cooperation Treaty based on it and to transact all business in the U.S. Patent and Trademark Office connected with either of them in accordance with instructions from the assignee of the entire interest in this application; or from the first or sole inventor named below in the event the application is not assigned; or from \_\_\_\_\_ in the event the power granted herein is for an application filed on behalf of a foreign attorney or agent.

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The authority under this Power of Attorney of each person named above shall automatically terminate and be revoked upon such person ceasing to be a member or associate of or of counsel to that law firm.

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